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BANDSAW WITH TWISTABLE SAW BAND

The present invention is directed to a bandsaw and, more particularly, to a bandsaw having a variable cutting capacity for receiving variable size workpieces.

Conventional bandsaws comprise a continuous endless saw blade (band) which is supported between two opposed transmission wheels at least one of which is power driven so as to effect the operation of the blade. One of the elongate lengths of the band disposed between the two opposed support wheels forms the cutting blade of such a bandsaw and will pass through an aperture in a support table or work surface. A workpiece may then be positioned onto the work surface and brought into engagement with the rapidly rotating saw blade to be cut thereby. Since the cutting edge of such bandsaw blade is disposed in a plane substantially parallel to the two axis of the transmission wheels, the maximum cutting depth permissible by such bandsaws corresponds to the maximum distance between the two adjacent elongate branches of the bandsaw loop. This in itself is often limited by practical equipment limitations and thus restricts the use of such bandsaws where longer lengths of the workpiece are required to be cut.

It is therefore an object of the current invention to alleviate the aforementioned problems in a cost effective manner.

According to the present invention there is now provided a bandsaw comprising a continuous saw blade driven in an endless elongate loop between two support members, whereby an elongate length of said loop extending between said support members provides an operative longitudinally extending cutting blade having an elongate axis and which passes through a work surface supported perpendicular to this cutting blade, characterised in that the bandsaw further comprises a blade guide member operatively associated with the work surface for effecting angular displacement of the cutting blade about its axis as it is supported by such guide member. Preferably, the cutting blade axis will be maintained perpendicular to the work surface along its entire length between the two support members and it is usual

that the blade guide member will be adjustable so as to allow selective variation of the angular adjustment of the cutting blade, preferably such angular adjustment being between 0 and 90°. In this manner, if the cutting blade is angularly inclined, a workpiece may be fed into such bandsaw at right angles thereto and the maximum cutting length of the workpiece will no longer be restricted by the distance between the adjacent elongate branches of the saw blade loop. In particular, if the angular adjustment is 90°, then there will be no limitation on the length of the workpiece that may be fed into the bandsaw.

Preferably, the bandsaw will further comprise locking means for restraining the guide means in a required position so as to maintain the angular displacement of the cutting blade effected by that guide means. This simply allows the operator to selectively adjust the angular displacement of the saw blade and to lock the guide means in a position on the bandsaw to maintain that preferred angular adjustment of the blade.

In one embodiment of the current invention, the guide member may comprise a plurality of longitudinally spaced guide surfaces which are co-operatively adjustable, usually by being interconnected, to effect this angular displacement of the cutting blade disposed between the guide surfaces.

It is preferable that the blade guide member will be mounted on the work surface since this is the main area where angular displacement of the blade is required and also provides a rigid support sufficient to withstand any resilient force exerted by the bandsaw blade when it is has undergone the angular displacement.

The blade guide member itself will usually comprises a support mechanism for engaging and supporting the cutting blade passing therethrough, this support mechanism being rotatably mounted about an axis co-axial with the blade axis. The support mechanism will usually comprise two opposed support wheels between which the blade passes, which support wheels rotationally engage with the blade itself to

compress the blade therebetween so as to retain the blade therebetween whilst such wheels still allow the blade to pass as the saw is operated. These support wheels further serve to apply an equally balanced angular displacement force to the blade to effect the appropriate angular displacement.

The support mechanism is preferably rotatably mounted on a guide track, such guide track being co-axial with the blade axis and secured from displacement relative thereto.

The blade guide member will also, preferably, comprise a manually operable drive member engageable with the support mechanism for effecting rotational displacement thereof and this drive member will preferably comprise a handle member pivotally mounted about a pivot axis which itself extends substantially parallel to the cutting blade axis. This drive member may further comprise a force transmitting member disposed between the handle member and the support mechanism for applying a displacement force to the support mechanism as the handle member is pivoted about its pivot axis.

Further according to the present invention, there is also provided a method of varying the cutting capacity of a bandsaw having an elongate length of saw blade extending between two support members defining an operative longitudinally extending cutting blade having an elongate axis, which cutting blade passing through a work surface supported perpendicular to this cutting blade; comprising the steps of effecting angular displacement of the blade about its axis in the region over the work surface and restraining the blade in this angularly displaced position. Preferably this method further comprises the step of maintaining the blade axis perpendicular to the work surface.

Usually this angular displacement will be effected by supporting the cutting blade in a blade guide member rotatably mounted about and co-axial with the blade axis and then effecting rotational displacement of the blade guide member about the blade axis.

A preferred embodiment of the current invention will now be described, by way of example only, with reference to the accompanying illustrative drawings in which:

Figure 1 is a side elevation of a bandsaw arrangement according to the prior art; and

Figure 2a is a cross sectional view of the bandsaw of Figure 1 along the lines II-II; and

Figure 2b is a schematic illustration of the view of Figure 2a showing variations incorporating the current invention; and

Figure 2c is a schematic partial side elevation of a bandsaw according to the present invention together with cross sectional views of the angular orientation of its cutting blade along its operative length; and

Figure 3 is a perspective view from one side of an adjustable blade guide member of the current invention; and

Figure 4 is a perspective view from below of the adjustable blade guide member of Figure 3; and

Figure 5 is a plan view from below of the adjustable blade guide member of Figure 4; and

Figure 6 is a side elevation of the adjustable blade guide member of Figure 4; and

Figure 7 is a plan view from below of the adjustable blade guide member of Figure 5 in a second operative position; and

Figure 7a is an enlarged schematic view of a restraint mechanism of the adjustable blade guide member of Figure 5; and

Figure 8 is a schematic illustration showing the angular adjustment of the bandsaw blade of the current invention.

Referring now to Figure 1, a bandsaw (10) of conventional design is shown. Bandsaw (10) comprises two opposed rotatable drive wheels (12) (here shown in dotted lines since they are housed within appropriate housing (14) of the bandsaw (10)). These wheels (12) support a continuous endless saw blade (16) in an elongate loop configuration. At least one of these wheels (12) will be driven by an electric

motor and conventional gearing arrangement so as to drive the saw blade (16) in this looped configuration (motor not shown). One elongate branch (18) of this saw blade (16) disposed between the two wheels (12) provides an elongate cutting blade (18) and passes through an aperture (19) in a support table or work surface (20). The work surface (20) is securely mounted on the bandsaw to form a rigid surface on which the work piece to be cut can be held by the operator and moved into engagement with the cutting blade.

A second elongate branch (22) of the saw blade (16) serves a saw blade return branch and is accommodated within an appropriate housing arrangement (24) substantially behind the work surface (20).

Bandsaws of this type are driven at relatively high speeds in the direction shown by the arrows in Figure 1 so as that the elongate branch (18) produces a cutting blade having a downward motion as it engages with a workpiece mounted on the work surface to perform a cutting operation. The downward cutting force driving the workpiece into the work surface to help maintain the workpiece in engagement therewith.

Referring now to Figure 2a showing substantially a plan view of the work surface (20) of the bandsaw (10), the operational limitation of such prior art bandsaws is clearly seen as the maximum operative cutting length L1 of such a bandsaw is defined as the distance between the cutting blade (18) and the inner housing wall (24) which is put in place to protect the operator from the return branch (22) of the saw blade (16). This limits the length of the workpiece that can be cut in any one operation. Whilst L1 may be increased by the manufacture of larger equipment having larger diameter drive wheels (12) or by passing the band (16) around a series of additional drive wheels (12), such solutions incur additional difficulties such as more complex drive mechanisms and blade support mechanisms plus the additional requirement of larger equipment occupying more floor space, which is often a premium in workshops where such machines are used.

In order to increase the efficiency of bandsaws of this type the current invention, as now schematically shown in Figure 2b, involves angularly adjusting, (or twisting), the bandsaw blade (18) in the region of the work surface (20). As seen in Figure 2b, the blade (18) has been angularly adjusted through an angle α relative to the unadjusted blade plane (23) (in which the blade, in an unadjusted position, is operative) whilst the return branch (22) of the blade is maintained in its original orientation in a plane parallel to the unadjusted blade plane (23). It will be appreciated that a workpiece (26) placed onto the work surface (20) so as to be brought into substantially right angled engagement with the angularly adjusted blade (18), now has an infinite operative cutting length (illustrated by line L2) since the workpiece length does not engage with the rear housing (24) of the bandsaw (10) during the cutting operation and thus any length may now be cut. The only particular limitation in this improved embodiment of a bandsaw will be the operative cutting depth D1 of the workpiece which can be cut before the workpiece engages with the housing member (24). Ultimately, if the angle α is increased to 90° then again the operative cutting length L2 of a workpiece is theoretically infinite whereas the depth limitation D1 of the workpiece to be cut will be limited to the distance L1 shown in Figure 2a (before such workpiece is restricted from displacement past the saw blade (18)). In this manner, it will be appreciated that angular adjustment of the saw blade (18) in the region of the work surface (20) can significantly increase the operative cutting capacity offered by such bandsaws.

Figure 2c schematically illustrates a preferred embodiment of the current invention whereby the cutting blade (18) of a bandsaw has been angularly adjusted through an angle α of 90° as it passes through the work surface (20). Basically, the bandsaw as shown in Figure 2c, corresponds substantially to that shown in Figure 1 with the exception that two adjustable blade guide members (30) (illustrated schematically as boxes in Figure 2c but which will be described in more detail later) are positioned one just below the work surface (20) and one above the work surface (20). Both guide members will be rigidly secured relative to the work surface (20) either by mounting thereon or by mounting on the frame of the bandsaw. Basically,

the blade guide members (30) will comprise a pair of guide wheels through which the blade (18) passes which may be angularly adjusted relative to the unadjusted blade plane (23) (Figure 2b) so that as the blade (18) passes through the guide wheels of the guide member (30) in the direction illustrated by the arrow of Figure 2c, the blade becomes aligned with such adjustable wheels. The current embodiment utilises two adjustable blade guide members (30) such that the blade passing between these two identical members (30) is held straight and in a constant plane. As is commonly understood, and now illustrated in Figure 2c, as the blade (18) leaves the upper drive wheel (12) (preferably passing between two guide wheels (101) disposed so as to maintain the blade (18) in the unadjusted blade plane (23) immediately adjacent such wheel (12)), the blade is gradually twisted from lying within the plane (23) to its angularly adjusted position as it passes through the work surface (20) having undergone angular displacement about its axis (A) of 90° in the embodiment shown. This gradual twisting is schematically illustrated in Figure 2c whereby cross sectional views of the blade (18) (relative to the blade plane (23)) along its length between the upper wheel (12) and the adjustable blade guide member (30) are schematically illustrated, clearly showing that angle α gradually increases along its length as the blade approaches the guide member (30).

Similarly, as the blade (18) leaves the second or lower guide member (30) and returns to the lower wheel (12) again the blade is twisted back about its axis (under its natural resilience) in the opposite direction until it is again aligned with the unadjusted blade plane (23) by use of further guide wheels (101) substantially adjacent to the lower wheel (12) (not shown).

Due to this gradual "twisting" of the blade about its axis (A), two blade guide members (30) are utilised, one each disposed either side of the work surface (20) such that the blade (18) extending between these two guide members (30) is maintained in the same plane as it passes through the work surface. As will be understood from the foregoing description, if only one blade guide member (30) was utilised then the blade (18) entering and leaving such guide member (30) would undergo a twisting effect as

illustrated in Figure 2c such that the blade passing through the work surface (20) would not extend perpendicular thereto along a uniform plane and, thus, would create an angular cut in the workpiece, which is undesirable.

Furthermore, whilst the schematic illustration in Figure 2c shows the blade (18) adjusted through an angle α of 90° prior to passing through the work surface (20), it will be appreciated that the blade guide members (30) can be designed such that angle α can be variable or adjustable between any number of preset values of α. Also, the use of guide wheels (101) is optional, whereby the inherent tension in the bandsaw blade (18), as it enters and leaves the respective wheels (12), will often be sufficient to ensure that the blade (18) returns to the plane (23) where it enters and exits such wheels (12).

A preferred method of angularly adjusting the cutting blade (18) will now be described in more detail with reference to Figures 3 to Figures 8.

Figure 3 illustrates a two-piece adjustable blade guide member (30) which comprises an upper track member (32) for securely mounting on the bandsaw (10) and to be restrained from displacement relative thereto. The guide member (30) illustrated in Figure 3 represents the lower guide member illustrated in Figure 2c (ie. below the work surface (20) and it is to be appreciated that the upper guide member (30) illustrated in Figure 2c is substantially identical to that now described with the exception that it is to be inverted when connected to the bandsaw. In the current embodiment, the guide member (30) is secured to the bandsaw (usually the work surface (20)) by engagement therewith of two integral upper projection members (34). This engagement can be achieved by one of a number of conventional methods but preferably, in this embodiment, may be bolted on to corresponding lugs extending downwardly from the underside of the support surface (20) (not shown).

This blade guide member (30) further comprises an adjustable blade support mechanism (36) integrally formed with a track following member (38) which is

maintained in sliding engagement with the upper track member (32) so as to be slideably displaceable about this track member (32). Both the track member (32) and the track following member (38) define co-axial arcuate paths to allow relative sliding displacement therebetween along such an arcuate path. In particular, referring to Figure 3, it can be seen that the upper track member (32) has a downwardly extending projection (40) which is received in a complimentary fit in a corresponding arcuate channel (42) formed in the track following member (38). Both projection (40) and the channel (42) are arcuate about a common axis (46) with this arcuate path being shown schematically by the dotted line (44) in Figure 7, whereby the common axis of this arcuate path is shown as point (46) in Figure 7 as it extends perpendicular out of the page. The track following member (38) is maintained in co-operative engagement with the track member (32) by being restrained between the track member (32) and an adjustment mechanism (60) (as will be described in detail below), which mechanism (60) being restrained in engagement with the track member (32).

The blade support mechanism (36) comprises a first, rear rotatable guide wheel (50) rotatably mounted on a bolt (52) so as to be freely rotatable thereabouts. This wheel (50) supports a rear surface (51) of the cutting blade (18) (band 16), effectively acting as a backstop for such blade. Bolt (52) is supported between two substantially elongate brackets (54) in a conventional manner, such brackets (54) having elongate slots to allow for adjustment of this guide wheel (50) if required. Disposed below such guide wheel (50), are two primary blade support wheels (56) both having parallel axis of rotation substantially perpendicular to the axis of rotation of wheel (50). Metal blade support wheels (56) are positioned so as to each engage the two opposed side faces of the cutting blade (18) as shown substantially in Figure 3. Metal is used to form such wheels (usually steel) to reduce wear due to the high speed at which the blade passes through such wheels. With reference to Figure 5, it can be seen that the lateral space in between these wheels (56) is relatively small so that the wheels exert a compressive force on the cutting blade (18) as it passes therebetween, effectively clamping the blade therebetween and resulting in rotation of the wheels (56) about their respective axis.

The particular arrangement of the wheels (50, 56) on the blade support mechanism (36) is conventional for this type of bandsaw blade to provide for additional support in the region of the work surface (20) where the blade will engage, in cutting operation, an appropriate workpiece. However, the major difference of the current invention is that this support mechanism (36) is rotatably displaceable about a central axis (46), (resulting from the arcuate paths of the track member (32) and the track following member (38) being co-axial with this axis (46)), which axis (46) coincides with the main longitudinal axis (A) of the elongate cutting blade (18) as illustrated in Figures 3 and 5. The cutting blade (18) is described as having a central axis (A) which extends in a longitudinal direction through the centre of the blade (18) (Figure 3 & Figure 8) so that the blade is substantially symmetrical about this axis.

Since the support mechanism (36) is rotatably displaceable about this axis (46), which extends co-axial with the blade axis (A) then the support wheels (56) are also rotatably displaceable about this axis (A)/(46) so as to effect angular displacement of the cutting blade (18) about this axis (A)/(46) as illustrated in Figure 8 (showing schematically a cross section through a non angularly displaced blade (18) and an angularly displaced blade (18')).

As illustrated in Figures 2a and 2b, an aperture (19) extending through the work surface (20) is substantially circular to accommodate such angular displacement of the cutting blade (18). In this manner, even though the cutting blade (18) has been twisted or angularly displaced about its axis (A) by the rotational displacement of the blade support mechanism (36), the axis (A) of the blade is not displaced as the cutting blade is rotated thereabouts but is maintained in the intersection of the original cutting plane ((100) in Figure 8) and the adjusted cutting plane (100')). This is an important aspect of this preferred embodiment of the current invention since if the blade were to be angularly adjusted so that the axis (A) was displaced by movement of the support mechanism (36) then the blade (16) would become inclined between the work surface (20) and the support wheels (12) which will result in an inclined cut of the workpiece and would effectively stretch the continuous saw band (18) which would require a compensation mechanism to be introduced into such bandsaw. However, by

maintaining the support wheels (56) co-axial with the blade axis (A) then a rotational displacement of such wheels simply effects a twisting of the blade (16) about its axis (A) to effect an angular displacement of the cutting blade (18) by an angle α as schematically illustrated in Figure 2b and Figure 8.

It is also important to note that adjustment of both of the guide members (30) shown in Figure 2c, should effect similar angular displacement of the saw blade (18) as it passes therethrough in order that the blade (18) (as it passes through the work surface (20)) does not undergo any additional twisting or angular displacement between the two guide members, thus maintaining the blade (18) in a uniform plane between these guide members.

Referring now to Figures 5 to 8 a preferred mode of effecting rotational displacement of the blade support mechanism (36) will now be described in more detail. The upper track member (32), as previously described, is fixedly mounted on the work surface (20) so as to be prevented from displacement relative thereto. The blade support mechanism (36) mounted on the track following member (38) is then rotatably displaceable about the track member (32) as previously described to achieve angular displacement of the cutting blade (18) in the region of the work table (20). This adjustable blade guide member (30) is thus further provided with an adjustment mechanism (60) which is manually displaceable to effect rotational displacement of the track following member (38) relative to and about the track member (32).

This adjustment mechanism (60) comprises a pivotally mounted lever member (62) (Figure 5) mounted about a first pivot member (71) having a pivot axis (Y) (Figure 5 and 6), which pivot member (71) is securely mounted on the upper track member (32). The pivot member (71) comprises a conventional hexagonal headed bolt wherein the bolt head is received within a complimentary fit in a hexagonal aperture within the lever member (62) as shown in Figure 5. The shank of this bolt (71) then passes through an arcuate aperture (68) in the track following member (38) (such that arcuate displacement of the track follower member relative to the track member (32) causes this arcuate aperture (68) to accommodate the bolt (71) passing

therethrough) and is received within a complimentary aperture through the track member (32), as shown in Figure 6, whereby the free end of the bolt member (71) then receives, in screw threaded engagement, a conventional nut (94). This nut (94) is then tightened on the bolt member (71) so as to substantially compress the track following member (38) between the lever member (62) and the track member (32) to retain it therebetween (Figure 6) as previously described. In this manner, the lever member (62) is thus pivotally mounted on the track member (32) so as to rotatable about axis (Y).

The lever member (62) is further provided with a secondary pivot member (95) (as shown in Figure 5 and, in hash lines, in Figure 6). This pivot member (95) defines a second pivot axis Z and is partially received in an opening (96) in the overlying track following member (38) as shown in Figure 6. This second pivot member (95) effectively acts as a force transmission member between the lever member (62) and the track following member (38), whilst allowing the track following member (38) to pivot about the axis (Z) as will now be described.

It will be noted from Figures 5 and 7 and the foregoing description, that the track member (32) is secured on the bandsaw from relative displacement thereto. Track following member (38) is then slideably adjustable along this track member (32) about an arcuate path. Furthermore, the lever member (62) is pivotally mounted on the track member (32) as previously described and rotatable about axis (Y). Thus, when viewing the mechanism shown in Figure 5, the application of a displacement force in direction (65) to the lever member handle (64) effects pivotal displacement of the lever member (62) about the axis (Y). This, in turn, causes rotational displacement of the second pivot member (95) (which is diametrically opposed about the first pivot axis (Y)) to rotate in the same rotational direction. Subsequently, engagement of the second pivot member (95) with the track following member (38) exerts a force therebetween which effects displacement of the track following member (38) in the direction indicated by arrow (67) in Figure 5, causing the track following member (38) to be arcuately displacement about axis (46) resulting from its engagement with the track member (32). It is noted here that the arcuate path of

displacement of pivot member (95) about axis (Y) follows a opposed curved path (about axis (Y)) to the arcuate displacement (44) of the track following member (38) relative to the track member (32). Therefore, as indicated by the hashed section (96) in Figure 6, this second pivot member (95) is effectively received within an elongate slot which will allow for lateral displacement of this member (95) relative to the track following member (38) whilst its restrained engagement with the sidewalls of such a slot effects force transmission in the direction (67) as shown in Figure 5. In this manner, rotation of the lever (64) in the direction (65) shown in Figure 5 effects displacement of the track following member (38) about its pivot axis (46) to the position shown substantially in Figure 7 whereby it has been rotated relative to the track member (32). Here it will be appreciated that the arcuate slot (68) formed in the track following member (38) permits the track following member to freely pass (in an arcuate path) over the bolt member (71). It will also be appreciated that, as viewed in Figure 7, should an opposite displacement force (165) be applied to the handle (64) then an opposed force will be transmitted through the second pivot member (95) to the track following member (38) to displace this track following member (38) back to its original position as shown in Figure 5.

The track following member (38) is pivotally displaceable about an axis (46) which corresponds to the blade axis (A) as indicated in Figure 5 and Figure 7. In this preferred embodiment, displacement of the handle (64) in the direction of (65) results in angular displacement of the blade (18) through an angle α of between 15° and 35° and, in this particular embodiment, through an angle α of 20°. However, it will be appreciated that the value of α actually chosen can be varied on the users requirement to anything between 0° and 90°.

The lever member (62) further comprises an end cam member (66) which is tapered to present two inclined and opposed cam surfaces (171 and 173), which cam surfaces (171, 173) are disposed so as to engage a resilient coiled spring member (69) which is adjustably inclined relative to a rear surface (70) of the blade support mechanism (36). Effectively the spring member (69) provides a restraint mechanism

for locking the lever arrangement (62) in either end stop position shown in Figure 5 or Figure 7. It is understood that the angular displacement of the cutting blade (18) through an angle α will result, due to the high tension in the bandsaw blade (18), in a resultant torque being exerted from the blade (18) to the adjustment member (30) through wheels (56) due to the increased tension effected by rotating this blade member about its axis. Therefore, means are necessary within the adjustment member (30) to resist such torque, and to restrain the blade (18) in its angularly adjusted state.

The spring member (69) engages with a rear projection (98) on the rear surface (70) of the blade support mechanism (36), so as to pivot thereabouts, and, at an opposed end thereof, comprises a cam engaging member (99) (in this preferred embodiment comprises a rotatable ball bearing (99) (Figure 7a)) having a substantially V-shaped groove for complimentary receipt of the cam member (66). The spring member (69) is compressed and retained between the rear projection (98) and the cam surface (66), so that the cam engaging member (99) is restrained from displacement out of the spring member (69) whilst remaining rotatable therein as the cam member (66) is displaced following movement of lever (64), as will now be described.

The spring member (69) is very stiff and remains compressed between the lever member (62) and the rear wall (70) when in a first end stop position shown in Figure 5. In this position, the compressed spring exerts a resilient force, through the cam member (66), against the lever (62), in a direction opposed to the displacement direction (65) illustrated. Since the cam engaging member (99) is rotatable within the spring (69) the V-shaped notch remains aligned with the cam surfaces so that, in this position, the resilient force is transmitted to cam face (173). Further displacement of the handle (64) from right to left, as viewed in Figure 5, is prevented due to engagement of end stops between the track member (32) and track following member (38) limiting the arcuate displacement therebetween to this extreme position. (End stops are conventional for this type of track following arrangement and need not be described any detail here). In this position, the cam following member (99) transmits the force from the spring member (69) to the face (173) of the cam member (66) to

exert a biasing force on the lever (62), maintaining the handle in this extreme position (shown). Subsequently, when the user applies a force in a direction (65) as shown in Figure 5, such force is transmitted about the pivot axis (Y) through the cam surface (173) to the cam following member (99) so as to effect further compression of the spring member (69). Simultaneously, displacement of the track following member (38) is also effected in the manner previously described. Continued displacement of the handle (64) in direction (65) continues to compress spring member (69) to a maximum compression whereby a longitudinal axis of the spring is aligned with a longitudinal axis of the handle (64) representing an equilibrium centre position whereby no resulting biasing force from the compressed spring member (69) is transmitted to either of the cam surfaces (171) or (173). As the lever is further displaced past this equilibrium position, the spring member (69) is displaced to an over-centre position such that a biasing force (F) (Figure 7a) is now exerted on the opposed cam surface (171) through the cam following member (99), which resulting biasing force from this compressed spring member (69) then serves to assist the displacement force (65) about the pivot axis (Y) causing continued displacement of the handle (64) to its final actuated position shown in Figure 7 (defined by further end stops between the track member (32) and track following member (38)). This additional displacement force from the spring provides an additional mechanical advantage for the lever means (62) to assist in continued twisting of the blade (18), to accommodate increased resistances (torque) exerted by the blade as angle α increases. It will be appreciated that as soon as the spring member (69) is displaced past its over-centre position the compressed spring (69) serves to effect a biasing force on the cam (66) to displace the handle towards one of its extreme positions shown either in Figure 5 and Figure 7 and effectively lock the handle in such extreme position.

Similarly, if the handle (64) is displaced in the opposed direction starting from the position shown in Figure 7 a similar force relationship will be achieved between the spring member (69) and the cam (66) but here the initial biasing force from the spring is exerted against the cam surface (171) as shown in Figure 7a .

The spring member (69) is required to have sufficient strength so that in the position shown in Figure 7 it is sufficient to withstand the resultant torque being exerted by the now twisted saw blade (18), which applies a biasing force on the track following member (38) in a clockwise direction (about axis (46)) as shown in Figure 7. Thus the spring (69) serves as a locking mechanism, on the handle. Due to the large torque exerted by the twisted blade (18) and the subsequent necessary strengths of the spring (69) it will be appreciated that considerable force is required to further compress the spring (69) in order to displace it past its over-centre position. For this reason, the handle (64) is necessarily long so as to provide sufficient leverage about the pivot axis (Y) in order to effect such compression of the spring member (69).

The angle α is defined as the angular adjustment of the blade (18) about its axis (A) or, alternatively, the angular adjustment between a first cutting plane (100) in which the blade was originally positioned to a second cutting plane (100)' into which the blade has been angularly adjusted.

The foregoing mechanism described for angularly adjusting the cutting blade (18) provides for a mechanism for displacing the blade between two extreme positions ie. the rest position and a twisted position having an angular displacement α. Whilst the degree of angular displacement α can be varied by appropriate design modifications to be anywhere between 0° and 90°, there are alternative embodiments whereby the degree of angular displacement α may be selectively varied between a plurality of different positions. For example, the use of the spring member (98) could be omitted from the embodiment shown in Figures 5 through 7 and instead, mechanical locking means (securely mounted on the bandsaw) could be used to physically engage with the handle (64) at one or more pivotally displaced positions of the handle (64) about axis (Y) to physically restrain the handle (64) in such predetermined positions. Here the predetermined position of engagement of the handle (64) will correspond to a predetermined arcuate displacement of the track following member (38) about the track member (32) corresponding to a known and predetermined value of blade displacement α. Locking mechanisms used to restrain a

pivotally displaceable handle in one or more predetermined positions are well known within the art and, by way of example only, could include a resiliently biased bar having a series of slots which will be biased so as to engage with the handle member (64) in a predetermined position thereby restraining it from further pivotal displacement about the axis (Y). Alternatively, the handle itself may have a spring loaded member which can be displaced out of engagement with co-operating apertures mounted rigidly on the bandsaw to allow pivotal displacement whereby the release of such a bias mechanism on the handle will then cause re-engagement with alternative holes or fixings on the bandsaw at set angular positions.

It is also possible the pivotal displacement of the lever member (62) could be effected by an electric motor and appropriate gearing, wherein the motor could also serve as an electro mechanical lock to restrain the handle in any one of a number of angular positions about axis (Y).

Furthermore, the work table or other portion of the bandsaw (10) may be provided with appropriate indicia against which displacement of the handle (64) can be measured and which will be indicative of the angular displacement of the cutting blade (18). Again this is not shown but it is well understood in operation whereby markings are often provided at 5° intervals against which the handle or a marker on the handle can be aligned as indicative of appropriate displacement of the handle to effect angular displacement of the cutting blade (18) through an angle represented by the indicia aligned therewith.

Additionally, it is often required that workpieces presented to such saw blade are positioned substantially at 90° and thus it is sometimes required to employ a fence for appropriate alignment of the workpiece at 90° relative to the saw blade so as to provide a right angle cut. In the prior art embodiment shown in Figure 1 the fence is easily aligned relative to the saw blade by reference to the housing (24). However, once the blade has been rotated then it will be necessary to realign any fence member mounted on the work surface. This can either be achieved by marking of appropriate

indicia on the work surface against which a fence member can be aligned reflective of the angular displacement measured by the indicia against which the handle (64) has been aligned, or alternatively, a fence engagement mechanism can be mounted for rotational displacement on the blade support mechanism (36) whereby such fence alignment mechanism will be rotated by the same angular variation as the angular displacement of the blade (18). Such alignment mechanisms can then be accessed through appropriate apertures within the work surface or by an appropriate projection mechanism extending beyond the work surface itself. Whilst these variations are not shown in the drawings, they are readily understood and readily derivable from the above description.

Whilst the above description represents a preferred example of the current invention, the invention is not limited to such an embodiment. In particular, the adjustment mechanism (60) described herein could be replaced by a very simple lever arrangement directly and securely mounted on the track following member (38) whereby lateral displacement of such a lever would translate to direct rotational displacement of the track following member (38) about the track (32). This provides for a much more simplified adjustment mechanism.

As previously mentioned, the preferred embodiment utilises two blade guide members (30) disposed either side of the work surface (20) such that the blade extending therebetween is adjusted to a uniform cutting plane through an angle α. Whilst the lower member (30) will be mounted on a work surface itself, a further rigid support mechanism (not shown) extending from the main body of the bandsaw will usually, support the upper mechanism (30). Here, each of the mechanisms (30) may be independently actuated by separate levers (64) or their levers (64) could be interconnected so that displacement of one effects simultaneous displacement of the other thereby simultaneously angularly adjusting the blade at both blade support mechanisms.

It will be more important to interlink the two adjustable blade support mechanisms (30) where alternative embodiments are used allowing for angle α to be adjusted through a plurality of alternative values.

Finally, whilst it is preferred to utilise two adjustable blade support mechanism (30) in order to maintain the blade (18) in a uniform plane adjacent to the work surface (20), it is also feasible that a single adjustable blade support mechanism (30) could be employed if the requirement for a perpendicular cut through a workpiece is not required.

A yet further embodiment of the present invention could alternatively replace the two distinct adjustable blade guide mechanisms (30) (shown in Figure 2c) with a single adjustable blade guide mechanism wherein the track following member (38) would support two longitudinally remote pairs of support wheels (56) for engaging with the blade (18) at two longitudinally remote positions such that both sets of wheels (56) are angularly displaceable about the track member (32) in a manner as described previously. Here, the blade (18) extending between these two pairs of wheels (56) will be maintained in a uniform plane during angular displacement about the blade axis (A). In this situation, one set of wheels (56) could be displaced below the work surface (20) and one set above the work surface (20). Thus the second pair of wheels disposed above the work surface (20) effectively replacing the need for a second blade adjustment means (30).